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(54) **Machine for pumping building materials**

Maschine zum Pumpen von Baustoffe

Machine de pompage de matériaux de construction

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(73) Proprietor: **TURBOSOL PRODUZIONE S.p.A.**
31030 Breda di Piave (IT)

(72) Inventors:
• **Alberti, Alberto**
31100 Treviso (IT)

• **Pagotto, Loris**
31040 Salgareda (IT)

(74) Representative: **Franzolin, Luigi et al**
STUDIO TORTA S.r.l.,
Via Viotti, 9
10121 Torino (IT)

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DE-A- 3 544 368

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Description

The present invention relates to a machine for pumping building materials, and in particular to a plastering machine for pumping plaster.

Plastering machines are known, which substantially comprise a tank for the material to be pumped; a drive assembly; and a pump assembly presenting a piston operated by the drive assembly and moving back and forth inside a cylinder communicating selectively, by means of respective nonreturn valves, with a suction conduit for drawing material from the tank, and a delivery conduit normally comprising a reinforced rubber hose which is substantially rigid radially and is fitted on the end with a gun.

Being a single-cylinder machine, the output from the delivery chamber fluctuates between zero and maximum during the intake and compression stroke of the piston respectively.

As this would obviously result in irregular supply and violent uncontrollable spraying of the material, known machines normally feature a compensating vessel connected to the inlet of the delivery conduit and substantially comprising a casing containing a given volume of air, either compressed or at atmospheric pressure, which is compressed during the delivery stroke so that part of the supply accumulates inside the vessel, and expands elastically during the intake stroke to supply the accumulated material.

This therefore provides for continuous flow at the outlet, with at most an acceptable periodic variation in supply.

Using a compensating vessel involves additional material, machining and assembly cost, and so increases the overall cost of the machine. Moreover, by virtue of operating with compressed air, the compensating vessel is subject to safety regulations governing pressure vessels and involving long, expensive approval procedures, which further increase the cost of the machine. And last but not least, when the machine is stopped, the pressure of the compensating vessel must normally be released to prevent the material from issuing from the gun, which means either constant attendance of the machine by the operator, or providing an automatic pressure release device.

DE-A-3 544 368 discloses a machine for pumping building materials in accordance with the preamble of claim 1. Such a machine is provided with a delivery conduit comprising a flow pulsation damper including a rigid outer tube and an inner tubular member which is elastically expandable. However, the damper constitutes a separate member of the conduit, which is costly, bulky, heavy and difficult to handle.

EP-A-0 580 018 discloses a machine for pumping building materials provided with a similar flow pulsation damper, which presents the same drawbacks as previously stated.

It is an object of the present invention to provide a

machine for pumping building materials, designed to overcome the aforementioned drawbacks typically associated with known machines.

The aforesaid object is achieved by a machine for pumping building materials as claimed in claim 1.

A preferred, non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a view in perspective of a plastering machine in accordance with the teachings of the present invention;

Figure 2 shows a partially sectioned, exploded side view of the delivery conduit of the Figure 1 machine;

Figure 3 shows a partial longitudinal section of the Figure 1 machine;

Figure 4 shows a partial section along line IV-IV in Figure 3;

Figure 5 shows a section along line V-V in Figure 2.

Number 1 in Figure 1 indicates a single-cylinder plastering machine.

Machine 1 substantially comprises a plaster tank 2; a drive assembly 3; a pump assembly 4 powered by drive assembly 3; and a delivery conduit 5.

Pump assembly 4 (Figure 3) comprises a horizontal cylinder 8; and a piston 9 sliding axially and in sealed manner inside cylinder 8, and presenting a rod 10 housed inside and close to the bottom of tank 2 and connected to drive assembly 3.

Drive assembly 3 comprises an electric motor 11; and a transmission 13 for converting rotation of the output shaft (not shown) of the motor into reciprocating linear motion of rod 10 and hence piston 9.

Rod 10 (Figure 4) conveniently presents transverse blades 13 close to the bottom of tank 2, for preventing the material from settling.

Pump assembly 4 also comprises an intermediate chamber 15 communicating with cylinder 8; a suction conduit 16 communicating at the inlet with tank 2 and connected at the outlet to intermediate chamber 15 via a first nonreturn ball valve 17; and a delivery chamber 19 connected to intermediate chamber 15 via a second nonreturn ball valve 18, and communicating with an outlet sleeve 20 fitted with a fitting 24 for connecting delivery conduit 5 and described in detail later on.

Pump assembly 4 also comprises a gauge 21 for measuring the pressure inside delivery chamber 19; and a drain conduit 22 connecting chamber 19 to tank 2 and fitted with a normally-closed hand-operated ball tap 23 which is opened, for safety reasons, to empty conduit 5.

Delivery conduit 5 (Figure 2) comprises a flexible reinforced-rubber hose 26 with fast-fit end fittings 24 for connection to fitting 24 on the pump assembly and to a known supply gun (not shown) or extension hose.

More specifically, hose 26 comprises an inner layer 27 of abrasion-resistant rubber; a reinforcing intermediate fabric layer 28 comprising a number of superim-

posed plies; and an outer cover layer 29 of rubber resistant to abrasion and atmospheric agents.

Briefly, machine 1 operates in known manner as follows.

During the intake stroke of the piston (leftwards in Figure 3), intermediate chamber 15 is depressurized, first nonreturn valve 17 opens to feed the plaster into chamber 15 and cylinder 8, and second nonreturn valve 18 closes. During the compression stroke (rightwards in Figure 3), the pressure increase inside chamber 15 closes valve 17 and opens valve 18, as shown, to feed the plaster into delivery chamber 19 and delivery conduit 5, so that pump assembly 4 generates a pulsating flow.

According to the present invention, hose 26 is elastic, and in particular elastically expandable, so as to define, in use, a variable capacity sufficient to absorb the flow pulsation generated by pump assembly 4.

Plastering machines typically present a piston displacement of 0.3 l to 1.2 l, feature hoses with an inside diameter of 25 to 65 mm, and operate at a pressure ranging between 0 and 12 bar for small machines, and 0 and 30 bar for larger types.

Within the above ranges, radial deformation of the hose, measured at the outside diameter, must conveniently be over 0.2% per 1 bar pressure increase, and is preferably 0.3 to 0.8% per bar.

With a normal hose length of 20 m, the above elastic deformation values have been found to generate a sufficiently continuous flow of material at the supply gun without recourse to a compensating vessel.

This is due to the fact that, during the compression stroke of piston 9, the pressurized plaster radially expands hose 26 which thus accumulates additional material, and the amount supplied by the gun is less than that supplied by pump assembly 4.

Conversely, during the intake stroke of piston 9, when no material is supplied by pump assembly 4, the output flow is uninterrupted by virtue of the material accumulated in hose 26 at the compression stroke being expelled when hose 26 contracts.

The advantages of the plastering machine according to the present invention will be clear from the foregoing description.

In particular, using elastic hoses provides for eliminating the compensating vessel of conventional machines, which in turn provides for reducing the production cost of the machine, eliminating approval cost of the vessel, and eliminating the need to release the pressure of the vessel each time the machine is stopped.

Similarly, the use of a delivery conduit formed by elastic hose 26 provides for eliminating rigid dampers with internal expandable tubes, and the drawbacks associated therewith. In particular, hose 26 presents the same flexibility and dimensions as conventional, nonexpandable hoses, and comparable costs.

Clearly, changes may be made to plastering machine 1 as described and illustrated herein without, however, departing from the scope of the claims.

In particular, delivery conduit 5 may comprise a number of hoses 26 connected in series by means of fast-fit fittings 24.

In this case, if flow pulsations are satisfactorily dampened by a single expandable hose 26 according to the present invention, the other hose or hoses can be of conventional type.

10 Claims

1. A machine (1) for pumping building materials, and comprising a tank (2) for the material to be pumped; a drive assembly (3); a pump assembly (4) in turn comprising a piston (9) moving back and forth inside a cylinder (8), and a suction conduit (16) for drawing material from the tank; and a delivery conduit (5); said cylinder (8) communicating alternately with said suction conduit (16) and said delivery conduit (5) via respective nonreturn valves (17, 18); said delivery conduit (5) including at least one elastically expandable tubular element (26) for absorbing the flow pulsation generated by the pump assembly (4), the machine (1) being characterized in that at least one whole longitudinal length of said delivery conduit (5) is constituted only by an elastic hose (26) which forms said elastically expandable tubular element, said at least one longitudinal length of said delivery conduit (5) being thereby bendable.
2. A machine as claimed in Claim 1, characterized in that it is a single-cylinder machine.
3. A machine as claimed in Claim 1 or 2, characterized in that said elastic hose (26) presents a radial deformation, measured at the outside diameter, of at least 0.2% per 1 bar pressure increase.
4. A machine as claimed in Claim 3, characterized in that said elastic hose (26) presents a deformation, measured at the outside diameter, of 0.3 to 0.8% per 1 bar pressure increase.
5. A machine as claimed in claim 1 or 2, characterised in that said elastically expandable tubular element is externally delimited by an outer cover layer of an elastomeric material resistant to abrasion and atmospheric agents.

Patentansprüche

1. Maschine (1) zum Pumpen von Baustoffen mit einem Tank (2) für das zu pumpende Material; einer Antriebsanordnung (3); einer Pumpenanordnung (4) mit einem Kolben (9), der sich in einem Zylinder (8) hin- und herbewegt, und einer Saugleitung (16) zum Abziehen von Material aus dem Tank; und ei-

ner Förderleitung (15); wobei der Zylinder (8) abwechselnd mit der Saugleitung (16) und der Förderleitung (3) über jeweilige Rückschlagventile (17; 18) kommuniziert; die Förderleitung (5) mindestens ein elastisch dehnbares Schlauchelement (26) zum Absorbieren der durch die Pumpenanordnung (4) erzeugten Flußpulsation aufweist, wobei die Maschine (1) dadurch gekennzeichnet ist, daß mindestens eine Gesamtlänge der Förderleitung (5) in Längsrichtung nur durch einen elastischen Schlauch (26) gebildet ist, der das elastisch dehnbare Schlauchelement bildet, wobei mindestens eine Gesamtlänge der Förderleitung (5) in Längsrichtung dadurch biegebar ist.

2. Maschine nach Anspruch 1, dadurch gekennzeichnet, daß sie eine Einzylindermaschine ist.
3. Maschine nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß der elastische Schlauch (26) eine am Außendurchmesser gemessene Radialverformung von mindestens 0,2 % je 1 Bar Druckanstieg hat.
4. Maschine nach Anspruch 3, dadurch gekennzeichnet, daß der elastische Schlauch (26) eine am Außendurchmesser gemessene Verformung von 0,3 bis 0,8 % je 1 Bar Druckanstieg hat.
5. Maschine nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß das elastisch dehnbare Schlauchelement außen durch eine Außendeckschicht aus einem elastomeren Material begrenzt ist, das gegenüber Abrieb und atmosphärischen Stoffen beständig ist.

manière élastique, ladite au moins une longueur longitudinale dudit conduit de décharge (5) étant de ce fait pliable.

- 5 2. Machine selon la revendication 1, caractérisée en ce qu'il s'agit d'une machine à un seul cylindre.
3. Machine selon la revendication 1 ou 2, caractérisée en ce que ledit tuyau élastique (26) présente une déformation radiale, mesurée au niveau du diamètre externe, d'au moins 0,2% pour 1 bar d'augmentation de pression.
- 10 4. Machine selon la revendication 3, caractérisée en ce que ledit tuyau élastique (26) présente une déformation, mesurée au niveau du diamètre externe, de 0,3 à 0,8% pour 1 bar d'augmentation de pression.
- 15 5. Machine selon la revendication 1 ou 2, caractérisée en ce que ledit élément tubulaire pouvant être dilaté de manière élastique est délimité à l'extérieur par une couche de revêtement externe en matériau élastomère résistant à l'abrasion et aux agents atmosphériques.

Revendications

1. Machine (1) de pompage de matériaux de construction, et comprenant un réservoir (2) pour le matériau devant être pompé, une unité d'entraînement (3), une unité de pompe (4) comprenant à son tour un piston (9) allant et venant à l'intérieur d'un cylindre (8), un tuyau d'aspiration (16) destiné à entraîner le matériau depuis le réservoir et un conduit de décharge (5); ledit cylindre (8) communiquant de manière alternative avec ledit tuyau d'aspiration (16) et ledit conduit de décharge (5) au moyen de clapets antiretour (17, 18) respectifs, ledit conduit de décharge (5) incluant au moins un élément tubulaire pouvant être dilaté de manière élastique destiné à absorber la pulsation d'écoulement générée par l'unité de pompe (4), la machine (1) étant caractérisée en ce que au moins une longueur longitudinale entière dudit conduit de décharge (5) est constituée uniquement d'un tuyau élastique (26) qui forme ledit élément tubulaire pouvant être dilaté de

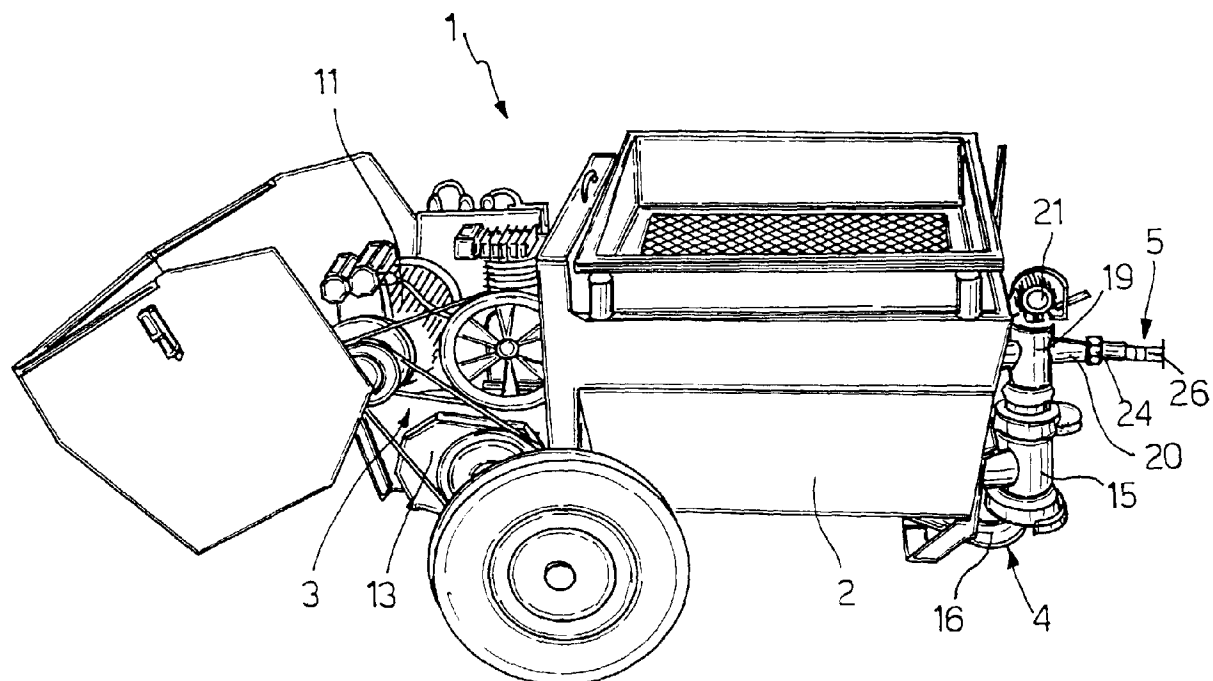


Fig. 1

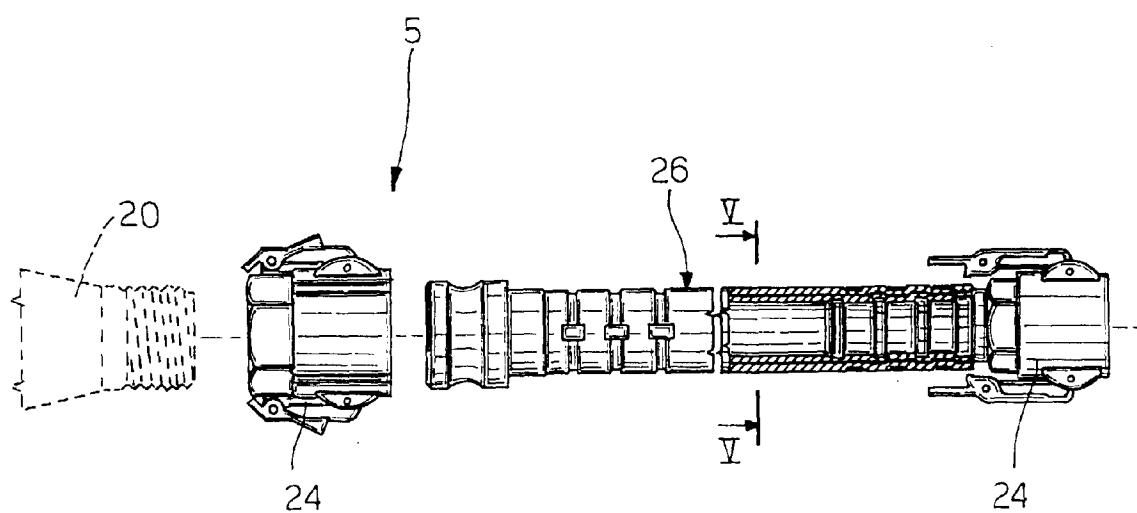


Fig. 2

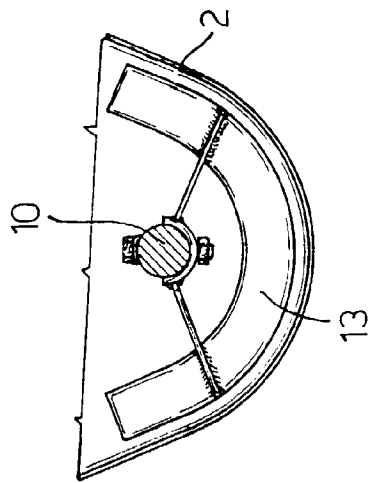


Fig. 4

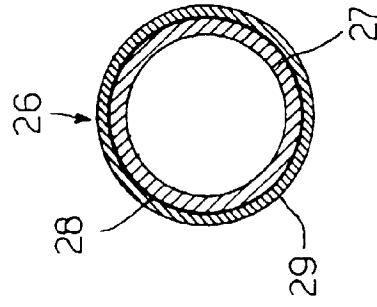


Fig. 5

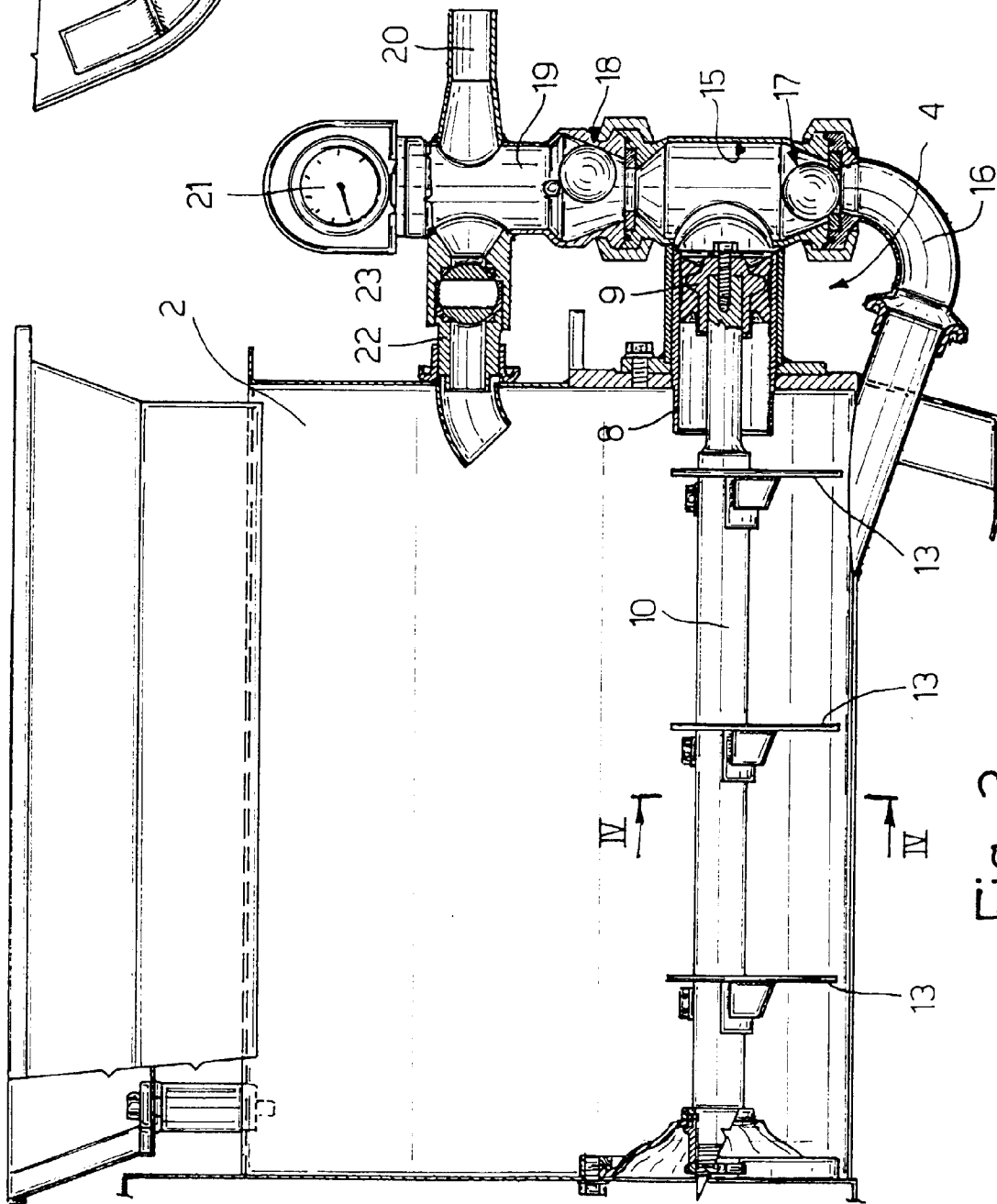


Fig. 3